NON-PUBLIC?: N
ACCESSION #: 8904180088
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station - Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000311

TITLE: Reactor Trip/SI from 100% Power Due to an Equipment Failure
EVENT DATE: 03/12/89 LER #: 89-005-00 REPORT DATE: 04/05/89

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: M. J. Pollack
LER Coordinator TELEPHONE: 609-339-4022

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: ED COMPONENT: INVT MANUFACTURER: G231
REPORTABLE TO NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On 3/12/89, both Steam Generator Feed Pumps (SGFPs) reduced their turbine speed to idle. The reactor subsequently tripped on No. 23 Steam Generator (S/G) Feed Flow/Steam Flow Mismatch with Low S/G Level. After the reactor tripped, a Safety Injection (SI) occurred on High Steamline Flow coincident with Low Steamline Pressure. The root cause of this event has been attributed to an equipment failure. A control power fuse, in the "D" Vital Instrument Inverter low voltage power source, came out of its fuse holder resulting in inverter failure and deenergization of "D" Vital Instrument Bus. Investigations concluded the fuse more than likely had come out of the fuse holder due to improper installation at some point in the past. The fuse assembly did not show any sign of damage or impairment which would cause the fuse to dislodge. Subsequently, the inverter fuse was reinstalled and successfully checked for continuity and tightness. The static inverter was started, tested satisfactorily and returned to service. Engineering is investigating the feasibility of separating the pressure channels to other vital inverters thereby eliminating the possibility of the occurrence of a similarly caused SI. New Vital Inverters are scheduled to be installed during

the next Unit 2 refueling outage. These inverters have a fast transfer feature. Engineering is evaluating the possibility of moving the inverter's alternate power source to the same bus as the normal supply. This coupled with the high speed transfer feature of the new Vital Inverters should prevent recurrence of this event.

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIIS) codes are identified in the text as xx

IDENTIFICATION OF OCCURRENCE:

Reactor Trip/Safety Injection From 100% Power Due To An Equipment Concern

Event Date: 3/12/89

Report Date: 4/05/89

This report was initiated by Incident Report No. 89-148.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 100% - Unit Load 1150 MWe

DESCRIPTION OF OCCURRENCE:

On March 12, 1989 at 0723 hours, during routine power operation, both Steam Generator Feed Pumps (SGFPs) reduced their turbine speed to idle. The reactor subsequently tripped on No. 23 Steam Generator (S/G) Feed Flow/Steam Flow Mismatch with Low S/G Level. After the reactor tripped, a Safety Injection (SI) occurred due to High Steamline Flow coincident with Low Steamline Pressure (less than 500 psig).

The Unit was stabilized in Mode 3 (Hot Standby), and in accordance with the requirements of the Code of Federal Regulations 10CFR 50.72 (b) (2) (ii), the Nuclear Regulatory Commission was notified of the automatic actuation of the Reactor Protection System JC and the automatic actuation of the Emergency Core Cooling System (ECCS) JE . This was the tenth SI actuation cycle to date.

APPARENT CAUSE OF OCCURRENCE:

The root cause of this event has been attributed to an equipment failure of the "D" Vital Instrument Inverter.

A control power fuse, in the "D" Vital Instrument Inverter low voltage power supply, came out of its fuse holder resulting in inverter failure and deenergization of "D" Vital Instrument Bus. The fuse was found still in its fuse knob. Investigations concluded the fuse (and its knob) more than likely had come out of the fuse holder due to improper installation at some point in the past.

ANALYSIS OF OCCURRENCE:

The "D" Vital Instrument Bus provides the AC power to the Master and

ANALYSIS OF OCCURRENCE: (cont'd)

Slave controllers used in SGFP control. Loss of the 120 VAC power causes the controllers to fail to minimum SGFP speed demand. Therefore, both SGFPs went to idle speed upon failure of the inverter. With the loss of Feedwater, the reactor tripped on Feed Flow/Steam Flow Mismatch coincident with Low Steam Generator Level.

The P-4 interlock actuates when the reactor trip breakers open. This interlock resets the high steam flow setpoint for SI to the no-load value. This causes the High Steam Flow bistables to actuate until actual steam flow decreases to below approximately 40%. This occurs rapidly following a normal trip. However, in this instance, due to the deenergized bus, the low steamline pressure bistables for Nos. 21 and 24 Steam Generators were actuated (Channel IV for both Steam Generators are fed from 2D Vital Instrument Bus). Therefore, the combination of high steamline flow (greater than 40%), which is normal following a full power trip, in conjunction with an indicated low steamline pressure on two loops satisfied the logic for initiation of safety injection and main steam line isolation.

Currently, the bus's alternate power source is administratively deenergized (tagged open) to maintain vital bus electrical separation. The normal power source is from "2B" 230 VAC Vital Bus and the alternate source is from the "2A" 230 VAC Vital Bus. The other vital instrument bus's ("A", "B", and "C") have uninterrupted power sources. They get power from the same respective 230 VAC Vital Busses.

Had the "D" Vital Instrument Bus alternate source been energized, the loss of "D" Vital Inverter would have resulted in the transfer of the "D" Vital Instrument Bus power source from the inverter output to the alternate source. However, the trip would still have occurred since the present transfer scheme takes approximately 3 seconds and the trip occurred in less than a second of inverter failure.

Due to the increased charging flow associated with the SI, Pressurizer pressure increased to the Power Operated Relief Valve (PORV) setpoint resulting in several lifts of valve 2PR2 (PORV).

This event involved no undue risk to the health or safety of the public. However, because of the automatic actuation of the Reactor Protection System, it is reportable in accordance with the Code of Federal Regulations 10CFR 50.73 (a) (2) (iv). In addition, due to the ECCS actuation, this report also fulfills the requirements of the ninety (90) day Special Report required by Technical Specification 3.5.2 (Action b).

CORRECTIVE ACTION:

The fuse knob and fuse holder assembly did not show any sign of damage or impairment which would cause the fuse to dislodge. Subsequently, the inverter fuse and fuse knob was reinstalled and successfully checked for continuity and tightness. The static inverter was started, tested satisfactorily and returned to service.

CORRECTIVE ACTION: (cont'd)

The Unit was returned to power operation on March 14, 1989.

Salem Generating Station System Engineering is investigating the feasibility of separating the pressure channels to other vital inverters thereby eliminating the possibility of the occurrence of a similarly caused SI.

Since the current inverter manufacturer (Garrett) is no longer in business, new Vital Inverters (Cyberex) have been scheduled for installation during the next Unit 2 refueling outage. These inverters have a power source "fast normal to alternate transfer" feature. System Engineering is evaluating the possibility of moving the instrument bus's alternate power source to the same Vital Bus as the normal source. This will allow the new "D" Vital Inverter to automatically transfer from the normal to the alternate power source if the vital inverter fails thereby ensuring uninterruptable "D" Vital Instrument Bus power. Salem Unit 1 has the same vital bus and inverter arrangement as Unit 2. However, during the current Unit 1 refueling outage, new vital inverters,

with the high speed transfer feature, will be installed.

POST SAFETY INJECTION DATA:

Final Pressurizer Level 26%*

Initial Pressurizer Pressure 2250 psig

Final Pressurizer Pressure 2250 psig*

Initial Average Reactor Coolant Temperature 570.5 degrees F

Final Average Reactor Coolant Temperature 547 degrees F*

Refueling Water Storage Tank Temperature 75.9 degrees F

Duration of Safety Injection 28 minutes

* - The Pressurizer Level had peaked to 100%
The Pressurizer pressure had peaked at 2340 psig
The minimum average Reactor Coolant Temperature during the event was 530 degrees F

General Manager -
Salem Operations

MJP:pc
SORC Mtg. 89-028

ATTACHMENT 1 TO 8904180088 PAGE 1 OF 1

PSE&G

Public Service Electric and Gas Company
P.O. Box E
Hancocks Bridge, New Jersey 08038

Salem Generating Station

April 05, 1989

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-75

DOCKET NO. 50-311
UNIT NO. 2
LICENSEE EVENT REPORT 89-005-00

This Licensee Event Report is being submitted pursuant to the requirements of the Code of Federal Regulations 10CFR 50.73 (a) (2) (iv). This report is being submitted within thirty (30) days of discovery.

Sincerely yours,

L. K. Miller
General Manager -
Salem Operations

MJP:pc

Distribution

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